Claims

[c1] 1. A method for at least one of quantifying, diagnosing and predicting disease relevant changes acquired from image data comprising:
applying at least one segmenting process to the image data to generate a plurality of segmented regions of interest;
extracting features relevant for a given disease from the segmented regions to generate extracted features; and,
mathematically modeling the features for use in one of diagnosing, quantifying and predicting changes indicative of the given disease.

[c2] 2. The method of claim 1 wherein the mathematically modeling step comprises using free boundary models such as those that obey von Neumann's Law.

[c3] 3. The method of claim 1 wherein the given disease is emphysema and the features relevant for emphysema are respective areas of affected regions of a lung, intensity of regions of the lung and number of edges of cells within the lung.

[c4] 4. The method of claim 1 further comprising analyzing the extracted features to assess severity and progression of the given disease.

[c5] 5. The method of claim 1 wherein the extracting step comprises generating at least one histogram analysis for a given feature in order to extract the feature.

[c6] 6. The method of claim1 wherein the region of interest is a lung and the image data is acquired by at least one of computed tomography (CT), magnetic resonance imaging (MRI), x-ray and ultrasound.

[c7] 7. The method of claim 6 wherein the segmenting step comprises segmenting a plurality of sub-regions within the lung and further segmenting for parameters within the sub-regions.

[c8] 8. The method of claim 4 further comprising generating output of the level and progression of the disease.

[c9] 9. The method of claim 8 wherein the output comprises highlighted regions

corresponding to values of the extracting step.

[c10] 10. The method of claim 9 wherein the highlighted regions are displayed overlaying the image data.

[c11] 11. The method of claim 8 wherein the output is used for at least one of staging the given disease in a patient, measuring response to therapy, phenotyping for patient selection to participate in drug trials, measuring stability of an anatomical structure and prediction of rate of change of the given disease.

[c12] 12. A system for at least one of quantifying, diagnosing and predicting disease relevant changes from acquired image data comprising:
an imaging device for acquiring the image data; and,
an image processor configured for applying at least one segmenting process to the image data to generate a plurality of segmented regions of interest and extracting features relevant for a given disease from the segmented regions to generate extracted features, and the image processor further configured for mathematically modeling the features for use in one of diagnosing, quantifying and predicting changes indicative of the given disease.

[c13] 13. The system of claim 12 wherein the mathematically modeling uses *free boundary models such as those that obey* von Neumann's Law.

[c14] 14. The system of claim 12 wherein the given disease is emphysema and the features relevant for emphysema are area of affected regions of a lung, intensity of regions of the lung and number of edges of cells within the lung.

[c15] 15. The system of claim 12 wherein the image processor is further configured for analyzing the extracted features to assess severity and progression of the given disease.

[c16] 16. The system of claim 12 wherein the image processor is configured to extract features by generating at least one histogram analysis for a given feature in order to extract the features.

[c17] 17. The system of claim 12 wherein the region of interest is a lung and the image data is acquired by at least one of computed tomography (CT), magnetic

resonance imaging (MRI), x-ray and ultrasound.

[c18] 18. The system of claim 17 wherein image processor is configured for segmenting a plurality of sub-regions within the lung and further segmenting for parameters within the sub-regions, the parameters being at least one of edges, area and intensity.

[c19] 19. The system of claim 12 further comprising an interface unit to display an output and wherein the output is used for at least one of staging the given disease in a patient, measuring response to therapy, phenotyping for patient selection to participate in drug trials, measuring stability of an anatomical structure and prediction of rate of change of the given disease.

[c20] 20. The system of claim 12 further comprising an interface unit to display an output and wherein the output comprises highlighted regions corresponding to values of the extracting step.

[c21] 21. The system of claim 20 wherein the highlighted regions are displayed overlaying the image data.

[c22] 22. A method for at least one of diagnosing, quantifying and predicting emphysema from acquired medical image data comprising:
applying at least one segmentation to the acquired medical image data to generate a plurality of segmented regions of interest;
extracting features relevant for emphysema from the segmented regions to generate extracted features;
mathematically modeling the features for use in one of diagnosing, quantifying and predicting changes indicative of the emphysema.

[c23] 23. The method of claim 22 wherein the mathematically modeling step comprises using free boundary models such as those that obey von Neumann's Law.

[c24] 24. The method of claim 22 wherein the features relevant for emphysema are area of affected regions of a lung, intensity of regions of the lung and number of edges of cells within the lung.